Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1 (Previously presented): A chain and sprocket drive system comprising:

a chain having a plurality of pairs of links being interconnected by pins;

one or more generally circular sprockets which operate at varying speeds and the chain having external tensions imparted to it originating from sources other than the sprocket, the sprockets having a plurality of teeth spaced about their periphery, the sprockets having roots located between pairs of adjacent teeth for receiving the chain pins;

each of the roots having a root radius extending between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction;

at least one of the roots having a first root radius, and at least one of the roots having a second root radius, at least one of the roots having a third root radius, the second root radius being less than the first root radius, the third root radius being less than the second root radius; and

the first, second, and third root radii arranged in a pattern which continually repeats itself around the periphery of the sprocket, the repeating pattern effective to redistribute the external tensions imparted to the chain, reducing maximum tension forces exerted on the chain during operation of the system relative to the maximum tension forces in the system where the sprocket is a straight sprocket.

Claim 2 (Previously presented): The chain and sprocket system according to Claim 1, wherein the pattern substantially repeats three times.

Claim 3 (Original): The chain and sprocket system according to Claim 2

wherein the root radii are arranged in a major pattern and a minor pattern.

Claim 4 (Canceled).

Claim 5 (Previously presented): The chain and sprocket system according to Claim 1 wherein the root radii are arranged in a pattern that also reduces noise produced by the interaction of said chain and said sprocket.

Claims 6–8 (Canceled).

Claim 9 (Previously presented): The chain and sprocket drive system according to Claim 1, wherein the first, second, and third root radii are arranged in a pattern that substantially repeats four times around the sprocket.

Claim 10 (Previously presented): A sprocket comprising:

a plurality of teeth disposed along a circumference of the sprocket, adjacent teeth having roots therebetween, each of the roots having a root radius defined as the distance between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction, the sprocket teeth and roots disposed to receive and engage a circular loop of chain which operates at variable speeds; and

at least three different root radii, including a first root radius, a second root radius and a third root radius, the second radius less than the first and the third less than the second,

the at least three different root radii arranged in a sequence which uninterruptedly and continually repeats itself around the sprocket for distributing the tensions imparted to the chain by the sprocket to one or more preselected orders relative to the rotation of the sprocket, the distributed tensions effective to offset tensions imparted to the chain by forces external to the sprocket reducing maximum tension forces exerted on the chain relative to maximum tension forces in the system where the sprocket is a straight sprocket.

Claim 11 (Previously presented): The sprocket according to Claim 10 wherein

the root radii are arranged in a plurality of sequences, at least one of which is major sequence and at least one of which is a minor sequence.

Claim 12 (Previously presented): The sprocket according to Claim 10 wherein the sequence of root radii also is effective to reduce the noise generated by the interaction of the sprocket and a chain.

Claim 13 (Previously presented): The sprocket according to Claim 10 wherein a preselected order comprises a fourth order.

Claim 14 (Canceled).

Claim 15 (Previously presented): The sprocket according to Claim 10 wherein the sequence repeats three times.

Claim 16 (Canceled).

Claim 17 (Previously presented): The sprocket according to Claim 10 wherein the sequence substantially repeats four times around the sprocket.

Claims 18–19 (Canceled).

Claim 20 (Previously presented): A method of distributing tensions imparted to a chain and sprocket system operating at variable speeds, the method comprising:

providing a sprocket having a plurality of teeth separated by roots;

providing each root with a root radius extending between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction;

providing at least three different root radii; and

arranging the different root radii in a pattern which continually repeats itself at least two times for distributing the tensions imparted to the chain and sprocket system reducing maximum tension forces exerted on the chain relative to maximum

tension forces in the system where the sprocket is a straight sprocket.

Claim 21 (Previously presented): The method according to Claim 20, wherein the pattern repeats three times.

Claim 22 (Previously presented): The method according to Claim 20 wherein a plurality of root radii patterns are selected, at least one a major pattern and at least one a minor pattern.

Claim 23 (Previously presented): A method according to Claim 20 comprising selecting the root radii pattern effective also to reduce the noise generated by the interaction of the chain with the sprocket.

Claim 24 (Original): The method according to Claim 20, comprising concentrating the tensions imparted to the chain by the sprocket at a fourth sprocket order.

Claim 25 (Original): The method according to Claim 20, comprising selecting the root radii pattern effective to at least partially offset tensions imparted to the chain by sources other than the sprocket to balance the overall tension force imparted to the system by all tension sources.

Claims 26–28 (Canceled).

Claim 29 (Previously presented): An automotive timing system comprising:

a chain which operates at variable speeds, the chain having a plurality of pairs of links being interconnected by pins; and

a generally circular sprocket mounted on a cam shaft having a plurality of teeth spaced about the periphery, the sprocket having roots located between pairs of adjacent teeth for receiving the chain pins,

each of the roots having a root radius extending between the center of the sprocket and a point along the root closest to the sprocket center in a radial

direction,

at least one of the roots having a first root radius, at least one of the roots having a second root radius, and at least one of the roots having a third root radius, the second root radius being less than the first root radius and the third root radius being less than the second root radius, and

the first, second, and third root radii arranged in a sequence which uninterruptedly and continually repeats itself at least two times and which maintains the distance between the chain pins substantially constant while the chain is engaged around the sprocket and effective to redistribute tensions imparted to the chain reducing maximum tension forces exerted on the chain during operation of the system.

Claim 30 (Previously presented): The automotive timing system according to Claim 29, wherein the sequence comprises second, third, third, second, first, second, third, third, second, first, second, third, third, second, first, second, third, third, and second root radii.

Claim 31 (Previously presented): The automotive timing system according to Claim 29 wherein the root radii sequence is effective also to reduce the noise generated by the interaction of the chain and the sprocket.

Claim 32 (Canceled).

Claim 33 (Currently Amended): An automotive drive system comprising:

a chain subject to tension loading sources external to the drive chain, the chain having a plurality of links, each link formed of two or more plates interconnected by pins, each pin having a central longitudinal axis, and the links providing contact surfaces;

the chain traveling in a loop about at least one sprocket in driving engagement with the chain and at least one sprocket in driven engagement with the chain, each sprocket having a central axis of rotation and plurality of surfaces spaced about the periphery of the sprocket disposed to engage the chain link contact surfaces;

the sprocket engagement surfaces spaced a distance from the sprocket central axis to position the chain at a pitch radius defined by the distance between the sprocket central axis and the pin axis of a chain link engaged by the surfaces; and

the engagement surfaces of at least one of the sprockets disposed to engage the chain at least at a first pitch radius, at least at a second pitch radius, and at least a third pitch radius, ~~each of~~ the first, second and third pitch radii being different and arranged in a pattern which continually repeats itself with each rotation of the sprocket and the pattern imparting tensions to the chain at one or more sprocket orders effective to reduce maximum chain tensions during operation of the system relative to maximum chain tensions of the system where the sprocket is a straight sprocket.

Claim 34 (Previously presented): The automotive drive system of Claim 33 wherein the system operates at variable speeds, the system speeds where chain tensions are generally at a maximum are the system resonance conditions; and the pattern of pitch radii are arranged to impart a maximum tension to the chain at said system resonance speeds.

Claim 35 (Previously presented): The automotive drive system of Claim 34 wherein the first pitch radius is greater than the second pitch radius and the second pitch radius is larger than the third pitch radius.

Claim 36 (Previously presented): The automotive drive system of Claim 35 wherein the pattern repeats at least twice with each rotation of the sprocket.

Claim 37 (Previously presented): The automotive drive system of Claim 33 wherein the pattern repeats at least three times with each rotation of the sprocket.

Claim 38 (Previously presented): The automotive drive system of Claim 33 wherein the driving sprocket is rotated by an automotive powerplant at varying speeds; the powerplant operating at one or more speeds that produce substantially maximum chain tensions; and the pitch radii patterns of the tension reducing sprockets are effective to reduce said maximum chain tensions relative to maximum chain tensions in a system where the sprocket is a straight sprocket.

Claim 39 (Previously presented): The automotive drive system of Claim 38 wherein the pitch radii pattern provided by each tension reducing sprocket is effective to produce a maximum chain tension that is substantially equal to or less than the chain tension in a system where the sprocket is a straight sprocket through the normal operating speed range of the powerplant.

Claim 40 (Previously presented): An automotive drive system operable at variable speeds comprising:

a chain subject to tension loads traveling in a loop about at least one sprocket in driving engagement with the chain,

and at least one sprocket in driven engagement with the chain, the system operating at one or more speeds where chain tensions reach a peak relative to chain tensions at other system speeds, the system having tensions imparted from sources other than the chain and sprocket,

the chain having a plurality of links formed of two or more plates interconnected by pins, each pin having a central longitudinal axis and the links providing chain contact surfaces,

the at least one sprocket having a central axis of rotation and a plurality of teeth and sprocket engagement surfaces between the teeth,

the teeth and the sprocket engagement surfaces spaced about the periphery of the sprocket, the sprocket engagement surfaces disposed to engage the chain link contact surfaces,

the sprocket engagement surfaces spaced a distance from the sprocket central axis to dispose the chain at a pitch radius defined by the distance between the sprocket central axis and the pin axis of a chain link engaged by the surfaces;

and

the engagement surfaces of at least one of the sprockets disposed to engage the chain to provide a sequence of at least a minimum pitch radius, at least a maximum pitch radius, and at least a intermediate pitch radii therebetween,

the engagement surfaces maintaining the distance between adjacent pin axes of links engaged with the sprocket substantially constant, and

the pitch radii sequence uninterruptedly and continually repeating itself at least twice with each rotation of the sprocket for imparting tensions to the chain timed with respect to tension loads imparted to the system from other sources effective to reduce maximum chain tensions at one or more of the peak tension speeds relative to the maximum chain tensions at said peak tension speeds where the sprocket is a straight sprocket.

Claim 41 (Previously presented): The automotive system of Claim 40 wherein the sequence repeats at least two times with each rotation of the sprocket.

Claim 42 (Previously presented): The automotive system of Claim 40 wherein the sequence repeats at least three times with each rotation of the sprocket.

Claim 43 (Previously presented): The automotive system of Claim 42 wherein an automotive power plant rotates the driving sprocket, the automotive power plant imparting periodic tension loads on the chain, the system reaching resonance conditions at powerplant speeds where the chain tensions reach their approximate maximum, and the sequence of pitch radii and the timing of the tensions provided by the pitch radii relative to the power plant tension loads are effective to reduce maximum chain tensions during operation of the system at said resonance conditions relative to the system where the sprocket is a straight sprocket operating at resonance conditions.

Claim 44 (Previously presented): The automotive system, of Claim 40 wherein the sequence substantially repeats at least four times with each rotation of the sprocket.

Claim 45 (Previously presented): A tension reducing sprocket for an automotive drive system having a continuous loop chain in driving engagement with a driving sprocket and a driven sprocket, the chain formed of two or more plates interconnected by pins, each pin having a central longitudinal axis, and the links providing contact surfaces disposed to engage the sprocket, the sprocket comprising:

a sprocket body and a central rotational axis, the sprocket body provided with engagement surfaces about its periphery, the engagement surfaces disposed to receive the chain link contact surfaces in a driving relation, the engagement surfaces spaced a distance from the sprocket central axis to position the chain link received thereon at a pitch radius defined by the distance between the sprocket central axis and the chain link pin axis; and

the engagement surfaces providing a repeating sequence of at least, three different pitch radii which uninterruptedly and continually repeats itself with each rotation of the sprocket, the sequence of the pitch radii effective to reduce maximum chain tensions during operation of the drive system relative to the system where the sprocket is a straight sprocket.

Claim 46 (Previously presented): The tension reducing sprocket of Claim 45 wherein at least the first and second pitch radii are selected and disposed to impose tension events on the chain timed with respect to torque loads imposed on the chain from other sources effective to reduce the maximum chain tensions during operation of the drive system relative to a system where the sprocket is a straight sprocket.

Claim 47 (Canceled).

Claim 48 (Previously presented): The tension reducing sprocket of Claim 45 wherein the engagement surfaces of the tension reducing sprocket are disposed to provide a repeating sequence of pitch radii having a minimum pitch radius, a plurality of pitch radii increasing to a maximum pitch radius, and a plurality radii decreasing to the minimum pitch radius.

Claim 49 (Previously presented): A chain and sprocket drive system comprising:

a chain having a plurality of pairs of links being interconnected by pins;

one or more generally circular sprockets having a plurality of teeth spaced about their periphery, the sprocket having roots located between pairs of adjacent teeth for receiving the chain pins;

each of the roots having a root radius extending between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction;

at least one of the roots having a first root radius, and at least one of the roots having a second root radius, at least one of the roots having a third root radius, the second root radius being less than the first root radius, the third root radius being less than the second root radius; and

the first, second and third root radii arranged in a pattern that substantially continually repeats itself four times around the sprocket, the pattern effective to redistribute tensions imparted to the chain, reducing maximum tension forces exerted on the chain during operation of the system relative to the maximum tension forces in the system where the sprocket is a straight sprocket.

Claim 50 (Previously presented): A sprocket comprising:

a plurality of teeth disposed along a circumference of the sprocket, adjacent teeth having roots therebetween, each of the roots having a root radius defined as the distance between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction, the sprocket teeth and roots disposed to receive and engage a circular loop of chain; and

at least three different root radii, the second radius being less than the first radius and the third radius being less than the second radius, the at least three different root radii arranged in a pattern around the sprocket that substantially continually repeats itself four times around the sprocket arranged in a pattern distributing the tensions imparted to the chain by the sprocket to one or more preselected orders relative to the rotation of the sprocket, the distributed tensions

effective to offset tensions imparted to the chain by other tension sources reducing maximum tension forces exerted on the chain relative to maximum tension forces in the system where the sprocket is a straight sprocket.

Claim 51 (Canceled).

Claim 52 (Previously presented): The automotive timing system according to claim 29, wherein the pattern comprises a sequence of second, third, third, second, first, second, third, third, second, first, second, third, third, second, first, second, third, third, and second root radii.

Claim 53 (Previously presented): The method according to claim 20 wherein the pattern repeats four times.